



Performance Evaluation Tool (v1.0)



- **9 Performance Metrics**
 - 4 classical metrics
 - Bias, Standard Deviation, Mean Squared Error (MSE), and Mean Absolute Percentage Error (MAPE)
 - 5 prognostic performance metrics
 - Prediction Horizon, Relative Accuracy, Cumulative Relative Accuracy, Convergence, and α - λ Accuracy
 - **Compares up to 4 different algorithms**
 - User can specify results file from the algorithms of their choice
 - **Ranks algorithms**
 - Indicates the best algorithm based on all 9 metrics individually
 - **3 Plots**
 - Plots Prediction Horizon and α - λ accuracy
 - Also plots prediction trajectories for visual assessment
 - **3 Performance parameters**
 - User can vary the performance parameters as they like and see the effects on performance results
 - **Plug and Play**
 - Modular design lets user to modify the metrics definition
 - Also possible to include other metrics with simple modifications
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- Results file for each algorithm to be compared
 - Prediction trajectory
 - Prediction time indices (t_p)
 - (optional) Prediction PDFs for predictions made at every t_p
 - Estimated RUL values for each prediction
 - Ground truth data for the application
 - EoL point
 - Failure Threshold
 - Time vector
 - Time indices (t_p) where predictions are asked for
 - Performance parameters
 - Alpha – accuracy modifier for α - λ accuracy, RA, and CRA
 - Lambda – time window modifier
 - Beta – confidence modifier (to be incorporated with distributions)
 - PHEB – accuracy modifier for Prediction Horizon
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Performance Evaluator (Ver 1.0)

Prognostic Performance Evaluator



Start

Algorithms **4**

ann_battery_results.mat

Algorithm 1 ID **A**

gpr_battery_results.mat

Algorithm 2 ID **B**

pra_battery_results.mat

Algorithm 3 ID **C**

rvm_battery_results.mat

Algorithm 4 ID **D**

battery_appData.mat

0.2

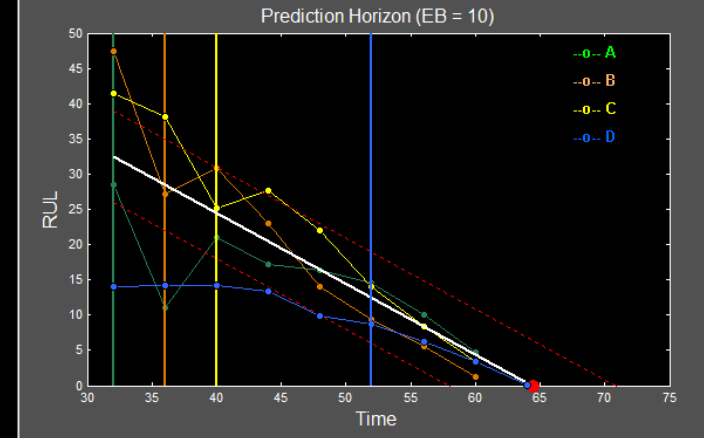
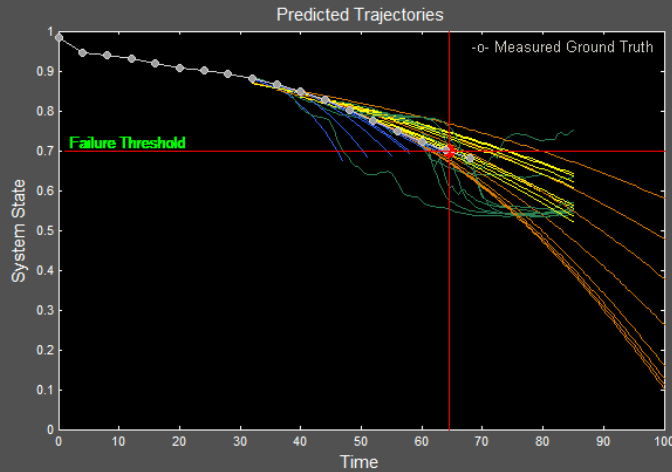
alpha

0.5

lambda

10

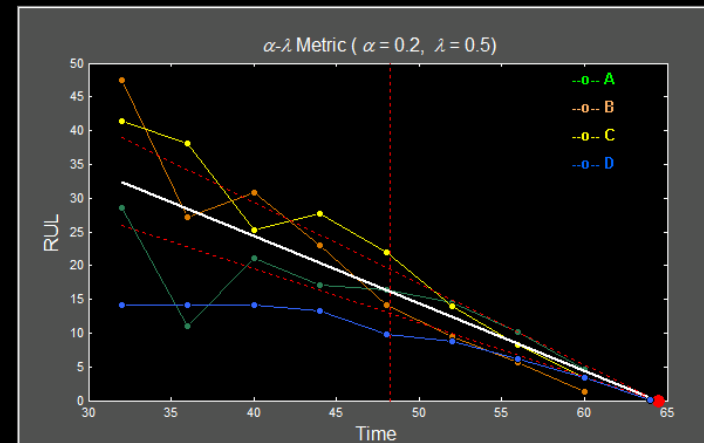
PH Error Bound



Performance Metrics Summary

	Bias	SSD	MSE	MAPE	PH	RA	CRA	Conv	A-L
A	-3.01	6.7	43.41	18.08	32.46	0.99	0.86	11.26	1
B	1.37	6.88	38.1	29.04	28.46	0.85	0.57	10.46	1
C	4.07	4.57	32.51	21.23	24.46	0.68	0.76	12.57	0
D	-7.12	6.57	84.81	41.36	12.46	0.6	0.63	14.8	0

4





Performance Evaluator ver1.0

Prognostic Performance Evaluator



Start

Algorithms **3**

gpr_bearing_results.mat

Algorithm 1 ID **A**

pra_bearing_results.mat

Algorithm 2 ID **B**

rvm_bearing_results.mat

Algorithm 3 ID **C**

Load results for Algorithm 4

Algorithm 4 ID **D**

bearing_appData.mat

0.2

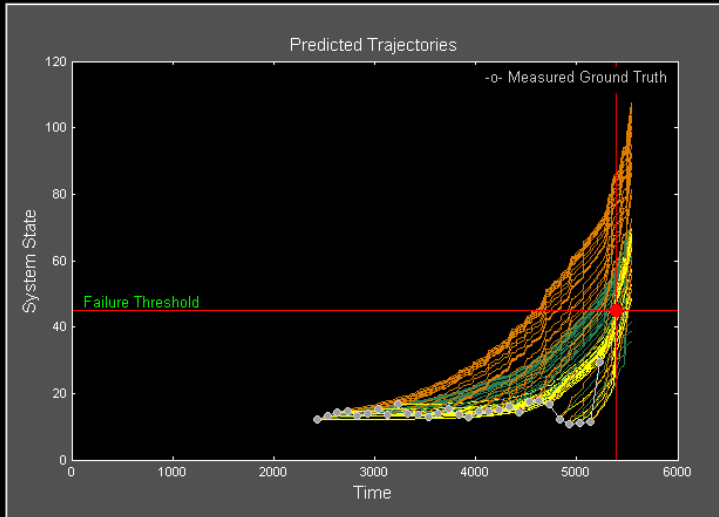
alpha

0.5

lambda

10

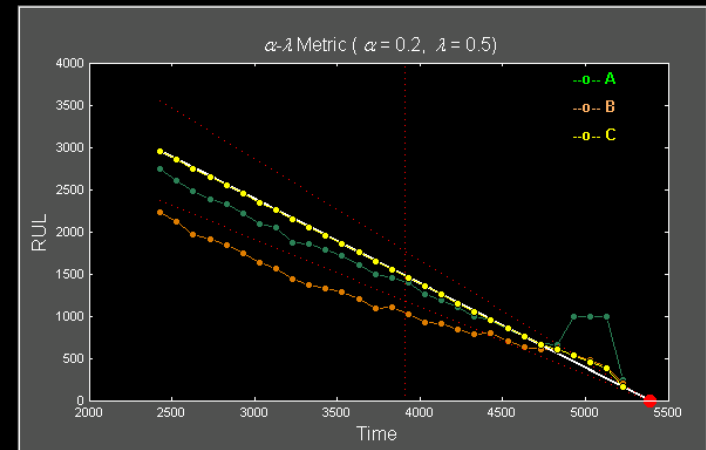
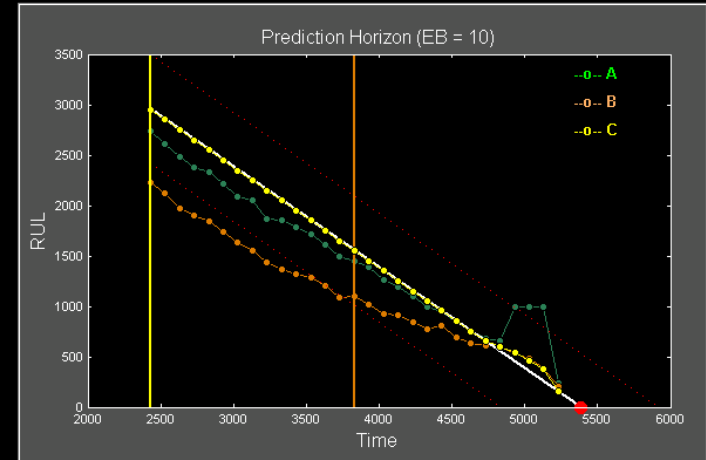
PH Error Bound



Performance Metrics Summary

	Bias	SSD	MSE	MAPE	PH	RA	CRA	Conv	A-L
A	48.23	268.45	69508.	28.75	2957	0.95	0.42	1170.5	1
B	411.44	319.4	26438	27.35	1557	0.71	0.73	1307.18	0
C	6.4	35.17	1194.25	3.85	2957	1	0.86	1332.69	1
D	0	0	0	0	0	0	0	0	0

3





- Add more functionality
 - Incorporate new metrics definition with probability distributions
 - Complete ranking of algorithms by each metric
 - A combined weighted ranking based on all metrics
 - Weighting scheme will be specified by the user
 - Ability to print plots
 - Flexibility to accept data in other formats as may be needed
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